This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

7*3 d 26

1783 d.26
G Floor

Thursday, 25 May 2006

BY

P. STEVENSON,
Instrument Maker to the Honourable Board of Excise for Scotland,
9 LOTHIAN STREET, EDINBURGH.

Entered in Stationers' Hall.

EDINBURGH:
PRINTED FOR THE AUTHOR,
BY A. MURRAY, MILNE SQUARE.
1848.

Sold only with the Instrument.

KEY

TO

GRAY'S

ALE BREWER'S ASSISTANT.

BY JAMES GRAY.

MADE FOR THE INVENTOR,

BY

P. STEVENSON,

Instrument Maker to the Honourable Board of Excise for Scotland,

9 LOTHIAN STREET, EDINBURGH.

Entered in Stationers' Hall.

EDINBURGH:

PRINTED FOR THE AUTHOR,

BY A. MURRAY, MILNE SQUARE.

1848.

☞ None are genuine but those copies that have the holograph signature of the Inventor.

TO

CHARLES DICK, ESQUIRE,

SIR,

My connection with you, in the capacity of Brewer, must be my apology for dedicating to you, as I hereby do with all respect, my ALE BREWER'S ASSISTANT, which I am persuaded will be found to be of the greatest service to the Practical Ale Brewer.

I have the honour to be,

SIR,

Your obedient Servant,

JAMES GRAY.

EDINBURGH,
March 28, 1848.

PREFACE.

Up till the present time little has been done to assist the practical Ale Brewer by Treatises on the art of Brewing. There have, indeed, been numerous works on the subject, but they have been either too large or too difficult to be understood by the generality of Brewers. If the Brewer has derived little assistance from Writings, he has derived still less from Instruments; the one now offered to him being only the *second* invented for his aid. It may surprise the public, and even some scientific men, to be told that it was not till 1784 that the first Instrument in Britain, invented to assist the Brewer—the Saccharometer—was brought forward by Mr John Richardson, Brewer at Hull. And now in 1848, I, a practical Brewer in Edinburgh, beg leave to bring under the notice of the profession the *second* Instrument, under the name of Gray's Ale Brewer's Assistant.

The Saccharometer, since its introduction, has undergone several alterations which, in the opinion of many Brewers, have enhanced its value. It now indicates degrees of specific gravity. My Instrument is constructed to work along with the Improved Saccharometer, and I humbly submit that a practical Brewer, with an average knowledge of his business, if he guides himself by the Saccharometer and my "Ale Brewer's Assistant," will have no difficulty in conducting successfully his operations, whether on a small or on a large scale.

The Saccharometer indicates what a Brewer *has* extracted from a given weight of material,—"Gray's Ale Brewer's Assistant" indicates what a Brewer *should* extract from a given weight of material. It is well known to every practical man that this has been an impossibility hitherto. Such it is stated to be in the latest published work on the subject. "To know before mashing," says Mr Roberts, in his "*Scottish Ale Brewer*," of which a new edition was published only last year,—"To know before mashing the quantity of extract which can be obtained from each quarter of malt, is a matter of impossibility even to the most experienced." This is an impossibility no longer. The Instrument now offered

by me to the Brewer supplies what has so long been a desideratum in his art. My "Ale Brewer's Assistant" consists of an *experimental* part, and a *practical* part. These I have more minutely described in the body of the "Key." I would only here remark that it is not necessary that the Brewer should experiment, unless he wishes nicely to ascertain the quality of his malt. He may work all his life long with only the practical part, for the Instrument is so constructed, that the Brewer, having once come to the knowledge of the average quality of his malt, and wishing to know what extract he ought to obtain from a different quality of grain that may have been put into his hand, can easily determine the question, by taking a higher or lower quality upon the scale.

I feel confident that my "Ale Brewer's Assistant" will contribute much to the mutual satisfaction of masters and servants. For instance, a master, not a practical Brewer, who may have invested a large capital in Brewery, with "Gray's Ale Brewer's Assistant" in his possession, can determine the quality of the material he purchases, the quality of what he puts into his brewer's hand, and the extract that ought to be obtained. The Brewer, too, can determine the quality of the material he receives to operate upon, and the amount of extract it should produce. In this way the Instrument will preserve harmony between master and brewer, while it will afford unprecedented assistance to both.

Be it remembered, that for accurate agreement all materials in Ale Brewing should be by weight, and all liquids should be taken at specific gravity, in opposition to the too general practice of working by measure of malt, and what is commonly termed *rule of thumb*. It is high time that so clumsy a method in the art of Ale Brewing were laid aside.

"Gray's Ale Brewer's Assistant" is comprised of fifteen weights,—two rules of quality and gravity, with slides, and a graduated measure and key. In connection with which, as in Brewery, also a small mill,—beam and scales,—copper mash tun, with sparging machine,—cooler,—fermenting back and casks.

James Gray

KEY, &c.

To understand and work by "Gray's Ale Brewer's Assistant,"

Observe,

The Instrument consists of two Rules and fifteen Weights, (two are dumb, or fixed, to avoid unnecessary weight in the Instrument)—arranged in a Box in three divisions respectively marked, and indicate ounces, pounds, quarters, accompanied with a graduated measure indicating barrels; and a KEY.

The Rules indicate quarters, barrels and gravity, ranging from twenty to one hundred and thirty-five degrees, and the Key to 137·5 degrees, specific gravity. On the Rules are six qualities of malt, with their directing numbers and decimals, under each given gravity, and in a line with each quality of malt, and in the Key, 14 qualities, to be set and read upon the slide rule, and give the barrels, *raw*, *boiled*, *cold*, with their respective gravities, according to the quarters of malt under operation.

The Instrument is constructed so as to experiment upon the lowest given weight from which any good result may be expected, up to a very high degree—(as the scientific man will readily perceive on examining the first weight of the first division,—the weight being so small that it requires a dumb or fixed plate to define its quality —the weight itself being too small to bear any impression,) and from thence to be an assistant to the practical Brewer to any extent.

The first division of five weights, marked oz. or ounces, are assigned to flavour; the second five, marked L, or pounds, to hops; the third, marked Q, or quarters, to malt—the three moveable weights in this division, answering all the purposes of *five*. Each of the three divisions reading from the left hand to the right, marked

$1, \frac{1}{36}. \frac{1}{4}, \frac{1}{9}. \frac{1}{2}, \frac{1}{18}. \frac{3}{4}, \frac{1}{27}. 1, \frac{1}{36}.$

to be understood thus:—In the third division, marked Q, assigned to Malt, the first weight to the left, marked B. 1, $\frac{1}{36}$, Q. is the lowest degree of experiment for one quarter of malt; the second weight, marked B. $\frac{1}{4}$, $\frac{1}{9}$. Q. for one quarter, or for nine quarters; the third weight, marked B $\frac{1}{2}$, $\frac{1}{18}$. Q. for one quarter, or for eighteen quarters; the fourth or first dumb or fixed, marked B. $\frac{3}{4}$, $\frac{1}{27}$. Q. is made up by putting the weights $\frac{1}{9}$ and $\frac{1}{18}$ into the scales, and signifies one quarter, or twenty-seven quarters; the fifth or second dumb or fixed, marked B. 1, $\frac{1}{36}$, Q. is made up by two weighings of the weight $\frac{1}{18}$, and signifies one quarter, or thirty-six quarters; as you thus read or vary this division of weights, you must read or vary the other two divisions of weights, should you bring them into your experiment in the weighing of hops or flavour,—also the graduated measure, which is likewise marked

1, $\frac{1}{36}$. $\frac{1}{4}$, $\frac{1}{9}$. $\frac{1}{2}$, $\frac{1}{18}$. $\frac{3}{4}$, $\frac{1}{27}$. 1, $\frac{1}{36}$.

I will now show how to work the Instrument. *First*, experimentally—and, *Second*, practically.

First, How to work the Instrument experimentally.

Various are the opinions, and contradictory the statements that have been given, respecting Extract from Malt, varying, I presume, according to the method on which the experiment was conducted, many of them giving little information to the practical Brewer; little confidence can be placed in, or help derived from, an experiment almost as limited as a counted number of barley-corns or pickles of malt, infused, it may be, as in a teapot. The large capital invested in brewery, and the nature of the art of brewing, surely justify research upon some other principle that may lead to a more practical assistance.

As I have termed the Instrument "Gray's Ale Brewer's Assistant," I must now be understood to treat with Operative Brewers, and I deem it the clearest method to give them a statement of actual experiment. He will bear in mind that all dry material is by weight, and all liquids by measure, by the barrel. The quarter of malt, 320 lbs. weight; the barrel, 36 gallons.

January 1848.

Experimented upon one quarter malt by the third mode of experiment, that is, by the third

weight, marked B. $\frac{1}{2}$, $\frac{1}{18}$. Q. which signifies, B, brewer; $\frac{1}{2}$, one half of the range of experimental weights; $\frac{1}{18}$, one quarter, or eighteen quarters; Q, quarter; all the five modes having the same signification according to their respective marks and numbers. The weight of malt was then taken by the third weight, which signifies one quarter or eighteen quarters, and the extract or wort measured by the graduated measure, taking $\frac{1}{2}$, $\frac{1}{18}$, as formerly explained, for one barrel or eighteen barrels, as under:—

Heat of mash tun, taken from 150° to 154°; heat of sparge, from 180° to 190°; runs from mash tun crane, taken about mid run, 1st, 73 deg. specific gravity; 2d, 17 deg.; 3d, 7 deg.; 4th, 3 deg., as under:—

First, Taken as one quarter.

1st,	per measure	3	brls. at	55	deg. is	165	deg. gravity.
2d,	„	3	„	16	„	48	„
3d,	„	3	„	7	„	21	„
4th,	„	3	„	3	„	9	„
One qr.	Measure	12				243	per quarter.

Thus showing from the quarter of malt, 12 barrels at 20·25 deg., or 243 deg. per quarter. I now mixed all the four extracts together in one vessel, and found them to be, as near as the Saccharometer will indicate, 20·25 deg.

Beyond this I deem it unnecessary to experiment for practical purposes. I, however, for farther satisfaction, and to follow out the experimental principle, extracted three barrels more, after one and a half hour's infusion, which indicated by the Saccharometer 1·5 deg., which if added to the above extract, 243 deg., will increase the extract per quarter to 247·5 deg., only 2·5 short of the second quality, which entitles the malt to be ranked in the second quality, being more than one half of the range betwixt the 3d and the 2d quality, which I lay down as a rule for all the qualities of malt.

Second, Taken as eighteen quarters.

1st,	per measure,	54	brls. at	55	deg. is	2970	deg. gravity.
2d,	„	54	„	16	„	864	„
3d,	„	54	„	7	„	378	„
4th,	„	54	„	3	„	162	„
Eighteen qrs.		216	„			4374	„

Thus showing from the eighteen quarters, 216 barrels at 20·25 deg. or 4374 deg., which gives 243 deg. as the produce of each quarter of malt mashed. Thus the experiment, tested by the Sac-

charometer, indicates the malt to be of the third quality for practical purposes, as shown upon the *rules* for assistance in practical operations. Should the experiment be carried further, by boiling the raw wort, you are guided as to your hops or flavour by the other divisions of the weights as before directed.

SECOND, How to work the Instrument practically, or to assist the Practical Brewer.

Hitherto, as I have already observed, the Operative Ale Brewer has had little assistance, notwithstanding that he is operating upon most valuable materials, and a defect or failure would be loss to a considerable amount.

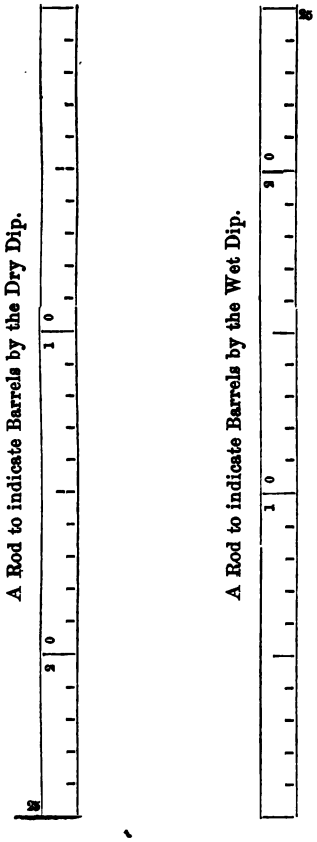
I would recal to his remembrance my observations respecting the statements that have been given by writers as to extract of malt, and I would here add, no more satisfactory or assisting have been the statements given as to *absorption*. Notwithstanding, to the success of his operations, it is most needful, in connection with *heat*, that he should possess a medium knowledge. Should he experiment upon *absorption*, he may come to a sounder conclusion than to range absorption from 27 to 54 gallons, and even upwards, per quarter or eight bushels, which I believe is so generally understood, as is six bushels the boll—(I beg here to intimate my opinion, that it would have been much better for ready practice had the quarter of malt been divided into ten bushels, instead of eight, the bushel would then have been of the weight of 32 lbs., or 320 lbs. a quarter. This is the mode I act upon in all my operations, viz., by tenths. Had monies been regulated by the same rule, malt at 6s. 4d. per bushel would at once be seen to be at 64s. per quarter, ten being a ready number to multiply or divide by)—showing a range of at least 27 gallons per quarter. This amount of *absorption*, viz., 54 gallons, I consider, with all due respect for Professor Donovan, is an error on his part, arising, as I apprehend, from the mode on which he conducted his experiments. My practice for many years warrants me in saying, that had he gone with this principle into operative brewing, he would, according to the common phrase, have *drowned the miller*. In my own experience I have found *absorption* to range between 20 and 30 imperial gallons per quarter of malt, the difference being caused by the state of dryness and manner

of grinding. Anything below or above this in ale brewing I regard as exceptions.

I must now insist upon the Ale Brewer, if he would work systematically, 1st, to have his grist by weight at 320 lbs. per quarter; 2d, to have his utensils all barrelled at 36 gallons per barrel.

To Barrel Utensils.

An easy method for practical purposes for those who may not understand guaging of utensils, is to fill them brimful with water. Procure a barrel of 36 imperial gallons, draw off from the utensil, barrel by barrel, marking each barrel upon the dipping rod, either for the dry or wet dip. In showing the barrels by the dry dip, as is best for *coppers*, the rod must have a *float* fixed upon the under end. Number the rod by tens from the opposite end, with a prominent mark for every five between the tens. For other utensils by the wet dip no float of course is used. Mark the rod by tens from the under end, with a prominent mark for every five between the tens.



My method for readiness in practice is to have my dipping rods barrelled, as described above, which shows the barrels at once without reference to a table-book. Coppers I take by the dry dip,

or by an index of barrels. Other utensils I take by the wet dip, or have an index of barrels impressed upon them. Malt I have in sacks of sufficient size to contain 160 lbs., or half a quarter, marked grist. The practical Ale Brewer, now operating upon a given number of quarters of malt, by weight, and directed to extract therefrom a given number of barrels, raw, boiled, and cold worts, with their respective gravities, having his utensils barrelled, with a knowledge of medium absorption, and applying the necessary regulated heat in his mash tun, aided by the Instrument, and working systematically, will hardly fail in bringing his operations to a satisfactory issue.

The Operative Brewer, having experimented upon his malt by "Gray's Ale Brewer's Assistant," and having found its quality to be of the third class, producing 243 deg. specific gravity, by the Saccharometer, now consults the Instrument to guide himself in the practical operation. This consists of two Rules, marked on the upper edge, No. 1, No. 2; to the left hand of which he finds marked the numbers, $\overset{1}{\text{Q}^{\text{u}}}$. $\overset{2}{\text{D}^{\text{s}}}$. $\overset{3}{\text{L}^{\text{s}}}$. $\overset{4}{\text{Q}^{\text{r}}}$. which signifies quality, degrees, pounds, quarters. The Rules indicate six qualities of malt, by the numbers, 1, 2, 3, 4, 5, 6; and the Key, fourteen qualities, with their respective degrees, pounds, quarters. In a line with which, horizontally along the Rules, and in the Key, are indicated what I term their pointing numbers and decimals, with their respective gravities, raw, boiled, cold.

The Rules indicate horizontally along the top line specific gravities from 20 to 135, and the Key to 137·5 deg. The under part of the Rules contain the slides, eight in number, two on each side of the two Rules. The upper slide is drawn from its place, and works in connection with the under slide by the stock. The under slide is not to be drawn from its place. These Rules indicate 1, or 10, or 100, or 1000, or to any extent, with their respective intervening numbers and decimals. They are marked barrels, quarters. They indicate or work thus:—

Set your given quarters by weight shown on the slide to the right hand to Φ, (or Zero) on the under stock, then look out the pointing numbers with their decimals, in a line with the quality of the malt you are to operate upon; and under the gravity that your wort is required to be in the back or tun, which gravity you will find horizontally on the first line of the Rules, or the Key, marked gravity; on the second, raw, boiled, cold, and on

the third line, barrels, gravity,—barrels, gravity, —barrels, gravity. Under each of these, and in a line with the quality of your malt horizontally, you will find your pointing numbers with their decimals, which point out your barrels raw, barrels boiled, barrels cold, with their respective gravities. Then look out your corresponding pointing numbers with their decimals on the upper stock of the Rule, and under each on the slide you will find your barrels raw, barrels boiled, barrels cold.

A Practical Example.

Mashed for Small Beer.

Three quarters malt, required gravity cold, 25 deg. The malt of the third quality, experimented on as before stated. Set three quarters on the slide to the right hand to Φ, on the under stock, then under 25 the given gravity, and on a line horizontally with the third quality, you find, 1st, the pointing number with its decimal, 11·7 raw barrels, raw gravity 20·5 deg.,—2d, 10·5 boiled barrels, boiled gravity 22·8 deg.,—3d, 8·7 cold barrels, cold gravity 25 deg. Which pointing numbers with their decimals, 11·7, 10·5, 8·7, read upon the upper stock, under which, upon the slide, you find the barrels, raw, boiled, cold, which you should extract from your three quarters of malt you are to mash. Thus you work to any extent of quarters, with their decimal parts of a quarter, and to any gravity indicated on the Rules, and in the Key, which range on the Rules from 20 to 135 deg., and in the Key, from 22·5 to 137·5 deg., at fives, that is, five degrees between each gravity. The Rules are so constructed as to save unnecessary size, and to answer practical purposes readily. But should the Brewer want gravities between the fives on the Rules, he has only to consult the mean Tables in the Key, which give the gravities with their pointing numbers and decimals, a practical instance of which will hereafter be shown.

The three quarters of malt will indicate thus by the "Assistant."

Pointing Nos.,	11·7,	gives Raw	brls. 35·0,	Gravity,	20·5	deg.
„	10·5,	„ Boiled	„ 31·5,	„	22·8	„
„	8·7,	„ Cold	„ 26·0,	„	25·0	„

For the satisfaction of the practical Brewer, with whom I am now treating, I here give a copy of my operations :—

Morning, 9 o'clock, the malt being emptied into the mash tun, I let on—

			Falling Heat.	Extract.	
1st Mash,	11 Brls.	at 155°	142°	9 brls.	at 51 deg.
2d „	8 „	at 168°	152°	8 „	at 17 „
3d „	8 „	at 164°	152°	8 „	at 9 „
4th „	8 „	at 164°	154°	10 „	at 2 „
				—	
	Evening, ½ past 2, in Copper,			35 brls.	at 20·0 deg.
	„	4, Boiled,		32 „	at 22·5 „
	Morning,	7, Cold,		27 „	at 24·0 „

This mash ranks in the 4th quality, 233·3 being 1·7 below the half of the range between the 3d and 4th qualities.

An Instance of a Brewing of Ale.

15 *quarters, required gravity,* 90 *deg.*

Following the directions already given as to the practical working of the "Assistant," your 15 quarters of malt of the 4th quality indicate thus:—

Pointing Nos.	3·0,	gives Raw	brls.	45·0,	Gravity,	73·8 deg.
„	2·7,	„ Boiled	„	40·5,	„	81·9 „
„	2·2,	„ Cold	„	33·0,	„	90·0 „

Having consulted the "Assistant," I obtained the information above stated, as to my 15 quarters of malt.

My general practice in Ale Brewing is to let into the mash tun what I term brake barrels, which I have found to range from one and a half to two barrels per quarter, according to the state of my grist, and gravity of the ale I am to brew. The heat of the brake barrels I take in the mash tun, having run it from the liquor copper, somewhat higher than I require it. I generally take the heat of my brake barrels from 175° to 180° and in some cases as low as 170°. My sparge generally ranges from 180° to 190°. Having taken my heat, I instantly empty from the grist sacks a good proportion of the grist, employing two men to empty the rest during the time of mashing, which generally ranges from thirty to fifty minutes. The mash I allow to stand from one hour and a half to two hours; my sparging I generally accomplish in from three to four hours. In cases where mashes do not go well, that time will be exceeded. I generally boil from one and a half to two hours, and in what I term good brewing weather, the temperature, ranging from 40 to 50 degrees, cools in about three hours. The hops range from four to six pounds per quarter, in some cases eight pounds, and for export, to twelve and fifteen pounds, &c. Yeast from four

to five pounds per quarter; when by the barrel, from one and a half to three pounds, according to gravity and circumstances. The heat of fermentation varies, ranging from below 50° to upwards of 60°.

The Thermometer and Saccharometer I hold to be indispensably connected in the art of Brewing. The heat of raw and boiled wort, when tested by the Saccharometer, I advise to be taken as high as the scale of heat, range 130°, or by some 150°, and cold wort at 60°. In taking the required dip or *barrels* in the copper of either raw or boiled wort, deduct from the full dip at the rate of *one barrel* for every *fifty* pounds weight of *hops* in the copper. As the hops may be added at twice, I advise to have the required dip and gravity of the *raw wort*, before adding the hops.

Morning 5, *mashed* 15 *quarters malt.*

Runs. Falling Heat.	Gravity.				Gravity.
154°	104	E. 1, in Copper,	Raw brls.	45·5,	75·0 deg.
154°	88	1¼ Hours,	Boiled, „	42·0,	82·0 „
152°	24	In Tun,	Cold, „	34·0,	91·0 „

Hops 60 lb. East Kent, 4 lbs. per quarter.

This brewing, including the small beer from weak worts, advances to the third quality of malt. Total extract, 240·4 deg.

Ale Brewers define their extract by the worts in the fermenting tun. This is not at variance with my method, with the exception that should they sustain loss by accident, or during the operation of Brewing, the quality of the malt is not indicated.

The extract, according to the Ale Brewer's general term, *fermentable matter*, is thus shown:—

34 brls. wort at 91 deg. is 3094 deg.
10·2 „ at 20 deg. is 204 deg.

Qrs. 15)3298(219·9 per quarter.
164·9 per boll.

This Brewing was collected in No. 3, Back or Tun E. p. 7, barrels, 34·0, gravity 91·0, set temperature 56°, yeast 60 lb., fermented 11 days, attenuated to 40 deg., highest degree of temperature 68°.

An Example of Porter.

Mash 13 quarters, 9 amber, 4 pale. Patent Malt, 170 lbs.; Hops, 169 lbs., or 13 lb. per quarter; required gravity, 75 deg.; malt taken at 4th quality.

The "Assistant" indicates thus :—

Pointing Nos.,	3·7, is Raw	brls. 48·3,	Gravity,	61·5	deg.
„	3·3, is Boiled	„ 43·0,	„	68·3	„
„	2·7, is Cold	„ 35·2,	„	75·0	„

Morning 5.

		Falling Heat.	Extract.		
1st Mash, 25 brls,	162°	150°	16 brls.	Gravity,	79 deg.
2d „ 15 „	174°	152°	15 „	„	53 „
3d Sparge 17 „	165°	150°	17 „	„	28 „

Evening 2,	in Copper,	48·0 brls.	Gravity,	59·0	deg.
Two Hours,	Boiled,	41·0 „	„	68·0	„
In Tun,	Cold,	33·0 „	„	75·0	„

The extract by this Brewing indicates the malt to be of the 5th quality, the extract being 217·8 deg. per quarter, but had the nature of the business allowed what is termed a return wort, for after-mashing, there might have been 20 barrels at 15 deg. extracted from the goods, or 300 deg. which would have brought up the quality of the malt to the 3d quality, being total extract, 241·5 deg. This Brewing was collected in No. 5, tun; barrels, 33·0; gravity, 75·0; set temperature, 61°; yeast, 65 lbs; fermented three days; attenuated to 27 deg.; highest degree of temperature, 75°.

AN INSTANCE OF A MEAN GRAVITY, OR A GRAVITY BETWEEN THE FIVES INDICATED ON THE RULES, AS BEFORE INTIMATED.

Mash 10·5 quarters for Ale; required gravity of wort, in tun, 58 deg. Malt taken at 3d quality, as on the Rules, as the required gravity is 58 deg. Look up in the mean Tables in the Key, the gravity, 57·5, and in a line with the quality of your malt, as on the Rules, the 3d horizontally, and under your gravity, 57·5, you find your pointing numbers, Raw, Boiled, Cold, with their respective gravities.

The "Assistant" indicates thus :—

Pointing Nos.,	Raw, 5·1,	gives brls. 53·6,	Gravity,	47·2	deg.
„	Boiled, 4·6,	„ „ 48·5,	„	52·4	„
„	Cold, 3·8,	„ „ 40·0,	„	57·5	„

Mash, Morning 5.

Runs Falling Heat.	Gravity.				Gravity.
150°	91.	E. ½ p. 1, in Copper,	Raw brls. 53·0,		47·5 deg.
148°	64.	1½ Hours,	Boiled, „ 48·0,		52·5 „
145°	0·7.	in Tun,	Cold, „ 40·0,		58·0 „

Hops, 42 lb. Sussex, 4 lb. per quarter.

This Brewing, there being no Beer after, the last run or extract being 7 deg., indicates the

malt to be of the 3d quality, giving 239·7 deg. per quarter. This Brewing was collected in No. 7, tun; E. 6; brls., 40·0; gravity, 58·0; set temperature, 59°; yeast, 42 lbs., 4 lb. per quarter; fermented 7 days; attenuated to 37 deg.; highest degree of temperature, 62°.

The foregoing examples stand thus:—

EXPERIMENTAL.

As 1 Quarter.

1st. Mash		3	brls., at	55	degs., is	165	degs.
2d.	„	3	„	16	„	48	„
3d.	„	3	„	7	„	21	„
4th.	„	3	„	3	„	9	„
		12		20·25		243	
5th.	„	3	„	1·5	„	4·5	
1 qr.		15				247·5	

As 18 Quarters.

1st. Mash		54	brls., at	55	degs., is	2970	degs.
2d.	„	54	„	16	„	864	„
3d.	„	54	„	7	„	378	„
4th.	„	54	„	3	„	162	„
		216	„	20·25	„	4374	„
5th.	„	54	„	1·5	„	81	„
18 qrs.		270	„			)4455	„
					per qr.,	247·5	„

PRACTICAL.

Malt taken at 3d quality, 3 quarters for Beer, given gravity 25.

As by the "Assistant."

Pointing No.	11·7	gives Raw	brls.	35·0	at	20·5	degs.
„	10·5	„ Boiled	„	31·5	„	22·8	„
„	8·7	„ Cold	„	26·0	„	25·0	„

As by the Brewing.

Raw	brls.	35·0	at	20·0	degs.	
Boiled	„	32·0	„	22·5	„	
Cold	„	27·0	„	24·0	„	

Malt taken at 4th quality, 15 quarters for Ale, given gravity 90.

As by the "Assistant."

Pointing No.	3·0	gives Raw	brls.	45·0	at	73·8	degs.
„	2·7	„ Boiled	„	40·5	„	81·9	„
„	2·2	„ Cold	„	33·0	„	90·0	„

As by the Brewing.

Raw	brls.	45·5	at	75·0	degs.	
Boiled	„	42·0	„	82·0	„	
Cold	„	34·0	„	91·0	„	

Malt taken at 4th quality, 13 *quarters for Porter, required gravity* 75 *degs.*

As by the Instrument.

Pointing No.	3·7	gives Raw brls.	48·3	at	61·5	degs.
„	3·3	„ Boiled „	43·0	„	68·0	„
„	2·7	„ Cold „	35·2	„	75·0	„

As by the Brewing.

Raw brls.	48·0	at	59·0	degs.
Boiled „	41·0	„	68·0	„
Cold „	33·0	„	75·0	„

Malt taken at 3d qualitq, 10·5 *quarters for Ale, given gravity* 58 *degs.*

As by the Instrument.

Pointing No.	5·1	gives Raw brls.	53·6	at	47·1	degs.
„	4·6	„ Boiled „	48·5	„	52·4	„
„	3·8	„ Cold „	40·0	„	57·5	„

As by the Brewing.

Raw brls.	53·0	at	47·5	degs.
Boiled „	48·0	„	52·5	„
Cold „	40·0	„	58·0	„

For further illustration, I subjoin a statement of a Brewing of Ale, at 80 degs. of gravity:—

Malt taken at 3d quality, 13·8 *quarters, required gravity* 80 *degs.*

As by the "Assistant."

Pointing No.	3·6	gives Raw brls.	49·7	at	65·6	degs.
„	3·2	„ Boiled „	44·3	„	72·8	„
„	2·7	„ Cold „	37·3	„	80·0	„

As by the Brewing.

Raw brls.	49·5	at	65·5	degs.
Boiled „	44·5	„	73·0	„
Cold „	37·2	„	80·0	„

I subjoin a statement of a Brewing of Ale at the gravity of 105 degs. as far back as 1840. The wort for said Ale was boiled at two boilings, which I do not approve of in Ale Brewing. The malt, as is generally the case in Ale Brewing, was by measure, but, previous to measuring, was cleaned by fanners, and therefore termed *clean malt,* in contradistinction to a term *rough malt,* which signifies that the malt was measured without the cummings being cleaned therefrom, which is accomplished at the mill by machinery. Hence the necessity of weighing the grist or ground malt, should the Brewer intend to work to given gravity.

CLEAN MALT.

16·5 *Quarters of malt as before stated by measure, gravity of Ale,* 105 *degs.*

As by the Instrument.

Pointing No.	2·5	gives	41·3 brls.	Raw,	at	86·1	degs.
„ „	2·3	„	38·0	„ Boiled,		95·6	„
„ „	1·9	„	31.3	„ Cold,		105·0	„

As by the Brewing.

	First Boiling.	Degs.	Second Boiling.	Degs.		Degs.
Raw	20·0 brls.	at 98·0	22·0 brls.	at 75·0=42·0	brls.	at 86·0
Boiled	19.0 „	109·0	19·0 „	87·0=38·0	„	98.0
Cold	15·0 „	120·0	15·0 „	95·0=30·0	„	107·5

Had the above been rough malt, we could not have expected this agreement of barrels and gravity with the "Assistant," the wort actually showing when collected and well mixed, 30·0 brls. at 106·0 degs.

Exception to the general rule of working the Slide Rules. The Ale Brewer fixes upon the number of quarters he is to brew, according to the gravity of his Ale, upon his previous knowledge of the size of his utensils. Working according to the exception, you can reverse this practice, and fix upon any given number of barrels, with the gravity you want in your fermenting tun, then read the number of quarters malt that are required to give the barrels.—Thus, set your required barrels on the slide to the right hand, to Φ. on the under stock, then on a line with the quality of your malt, and under your given gravity in the column, Cold Barrels, you find your pointing number and decimal, the which read upon the slide, under which, upon the under stock, you will find yonr quarters malt required. For instance, for 40 barrels of worts in fermenting tun, at 100 degs. of gravity, how many quarters of malt will I require to mash? Set 40 barrels on slide to Φ. on under stock, then in a line with malt of 3d quality, and under given gravity, 100 degs. in column cold wort, is pointing number and decimal, 2·1, and under 2·1 on slide, is 19 quarters on the under stock—the required *quarters.*

Exceptions as to the quality of Malt.

Having read of some uncommon extracts of malt, which I term exceptions, I here subjoin pointing numbers, with their decimals, for four qualities of malt above, and four below, the qualities given on the rules—which pointing numbers and decimals is to be read as on the rules, raw, boiled, cold, with their respective barrels and gravities—according to the general rule.

1	2	Gr. 110			115			120			125			130			135			1
Qu.	Ds.	R	B	C	R	B	C	R	B	C	R	B	C	R	B	C	R	B	C	Qu.
		Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	
Above the Rules. 4	300	3·2	2·9	2·3	3·0	2·7	2·2	2·9	2·6	2·1	2·7	2·5	2·0	2·6	2·4	1·9	2·5	2·3	1·9	4
3	290	3·1	2·8	2·3	3·0	2·6	2·2	2·8	2·5	2·1	2·7	2·4	2·0	2·5	2·3	1·9	2·4	2·2	1·8	3
2	280	3·0	2·7	2·2	2·8	2·5	2·1	2·7	2·4	2·0	2·6	2·3	1·9	2·4	2·2	1·8	2·3	2·1	1·7	2
1	270	2·8	2·6	2·1	2·7	2·4	2·0	2·6	2·3	1·9	2·5	2·1	1·8	2·3	2·1	1·7	2·2	2·0	1·6	1
Above the Rules. Qu.	Ds.	80			85			90			95			100			105			Qu.
4	300	4·5	4·4	3·3	4·2	3·8	3·1	4·0	3·6	2·9	3·7	3·4	2·8	3·5	3·2	2·6	3·3	3·0	2·5	4
3	290	4·3	3·9	3·2	4·1	3·7	3·0	3·8	3·4	2·8	3·6	3·3	2·7	3·4	3·1	2·5	3·2	3·0	2·4	3
2	280	4·2	3·8	3·1	3·9	3·5	2·9	3·7	3·3	2·7	3·5	3·1	2·6	3·3	3·0	2·4	3·1	2·8	2·3	2
1	270	4·0	3·6	3·0	3·8	3·4	2·8	3·6	3·2	2·6	3·4	3·0	2·5	3·2	2·9	2·3	3·0	2·7	2·2	1
Above the Rules. Qu.	Ds.	50			55			60			65			70			75			Qu.
4	300	7·3	6·6	5·4	6·6	6·0	4·9	6·1	5·5	4·5	5·6	5·0	4·1	5·2	4·7	3·8	4·8	4·3	3·5	4
3	290	7·1	6·4	5·2	6·4	5·8	4·8	5·9	5·3	4·3	5·4	4·9	4·0	5·0	4·5	3·7	4·6	4·2	3·4	3
2	280	6·8	6·2	5·0	6·2	5·6	4·6	5·7	5·1	4·2	5·2	4·7	3·8	4·8	4·3	3·6	4·5	4·0	3·3	2
1	270	6·6	5·9	4·9	6·0	5·4	4·4	5·5	5·0	4·0	5·0	4·5	3·7	4·6	4·2	3·4	4·3	3·9	3·2	1
Above the Rules. Qu.	Ds.	20			25			30			35			40			45			Qu.
4	300	18·3	16·5	13·5	14·6	13·2	10·8	12·2	11·0	9·0	10·5	9·4	7·7	9·2	8·2	6·8	8·1	7·3	6·0	4
3	290	17·7	15·9	13·1	14·2	12·7	10·4	11·8	10·6	8·7	10·1	9·1	7·5	8·8	8·0	6·5	7·9	7·1	5·8	3
2	280	17·1	15·4	12·6	13·7	12·3	10·1	11·4	10·3	8·4	9·8	8·8	7·2	8·5	7·7	6·3	7·6	6·8	5·6	2
1	270	16·5	14·8	12·2	13·2	11·8	9·7	11·0	9·9	8·1	9·4	8·5	6·9	8·2	7·4	6·1	7·3	6·6	5·4	1

This Table reads upwards, indicating 4 Qualities of Malt, with their pointing Numbers above the Qualities on the Rules. Their respective Gravities—Raw, Boiled, Cold—read as on the Rules.

This Table reads downwards, indicating 4 Qualities of Malt, with their pointing Numbers below the Qualities on the Rules. Their respective Gravities—Raw, Boiled, Cold—read as indicated on the Rules.

1	2	Gr. 20			25			30			35			40			45			1
Qu.	Ds.	R	B	C	R	B	C	R	B	C	R	B	C	R	B	C	R	B	C	Qu.
		Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	Br.	
Below the Rules. 1	200	12·2	11·0	9·0	9·8	8·8	7·2	8·1	7·3	6·0	7·0	6·3	5·1	6·1	5·5	4·5	5·4	4·9	4·0	1
2	190	11·6	10·4	8·6	9·3	8·3	6·8	7·7	7·0	5·7	6·6	6·0	4·9	5·8	5·2	4·3	5·2	4·6	3·8	2
3	180	11·0	9·9	8·1	8·8	7·9	6·5	7·3	6·6	5·4	6·3	5·6	4·6	5·5	5·0	4·1	4·9	4·4	3·6	3
4	170	10·6	9·3	7·7	8·3	7·5	6·1	6·9	6·2	5·1	5·9	5·3	4·4	5·2	4·7	3·8	4·6	4·2	3·4	4
Below the Rules. Qu.	Ds.	50			55			60			65			70			75			Qu.
1	200	4·9	4·4	3·6	4·4	4·0	3·3	4·0	3·6	3·0	3·7	3·3	2·7	3·4	3·1	2·5	3·2	2·9	2·3	1
2	190	4·6	4·2	3·4	4·2	3·8	3·1	3·8	3·4	2·8	3·5	3·2	2·6	3·2	2·9	2·4	3·0	2·7	2·2	2
3	180	4·4	4·0	3·2	4·0	3·6	2·9	3·6	3·3	2·7	3·3	3·0	2·5	3·1	2·8	2·3	2·9	2·6	2·1	3
4	170	4·2	3·7	3·1	3·7	3·4	2·8	3·4	3·1	2·5	3·1	2·8	2·3	2·9	2·7	2·2	2·7	2·4	2·0	4
Below the Rules. Qu.	Ds.	80			85			90			95			100			105			Qu.
1	200	3·0	2·7	2·5	2·8	2·5	2·0	2·6	2·3	1·9	2·5	2·2	1·8	2·3	2·1	1·7	2·2	2·0	1·6	1
2	190	2·8	2·5	2·1	2·6	2·4	1·9	2·5	2·2	1·8	2·3	2·1	1·7	2·2	2·0	1·6	2·1	1·9	1·5	2
3	180	2·7	2·4	1·9	2·5	2·2	1·8	2·3	2·1	1·7	2·2	2·0	1·6	2·1	1·9	1·5	2·0	1·7	1·4	3
4	170	2·5	2·3	1·8	2·3	2·1	1·7	2·2	2·0	1·6	2·1	1·9	1·5	2·0	1·8	1·4	1·8	1·7	1·4	4
Below the Rules. Qu.	Ds.	110			115			120			125			130			135			Qu.
1	200	2·1	1·9	1·5	2·0	1·8	1·4	1·9	1·7	1·4	1·8	1·6	1·3	1·7	1·5	1·2	1·6	1·4	1·2	1
2	190	2·0	1·8	1·4	1·9	1·7	1·4	1·8	1·6	1·3	1·7	1·5	1·2	1·6	1·4	1·2	1·5	1·4	1·1	2
3	180	1·8	1·7	1·4	1·7	1·6	1·3	1·6	1·5	1·2	1·6	1·4	1·2	1·5	1·3	1·1	1·4	1·3	1·0	3
4	170	1·7	1·6	1·3	1·6	1·5	1·2	1·5	1·4	1·1	1·5	1·3	1·1	1·4	1·3	1·0	1·3	1·2	1·0	4

Four Tables of Mean Pointing Numbers, that is, between the fives on the Rules, with their respective Gravities—Raw, Boiled, Cold—with Four Qualities above and Four below the Six Qualities indicated on the Rules—wrought on the Slide Rules, according to the general rule.

No. 1.

1	2	Gr.	22·5						27·5						32·5						37·5						42·5						47·5						1
Qu.	Dg		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		Qu.
			Br.	Gr.	Br.	Gr.	Br.	Gr.	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
Above the Rule. 4	300		16·5	..	14·9	..	12·2	..	13·4	..	12·1	..	9·9	..	11·4	..	10·2	..	8·4	..	9·9	..	8·8	..	7·3	..	8·7	..	7·8	..	6·4	..	7·7	..	7·0	..	5·7	..	4
Above the Rule. 3	290		16·0	..	14·3	..	11·8	..	13·0	..	11·7	..	9·6	..	11·0	..	9·9	..	8·1	..	9·5	..	8·6	..	7·0	..	8·4	..	7·6	..	6·2	..	7·5	..	6·8	..	5·5	..	3
Above the Rule. 2	280		15·4	..	13·9	..	11·4	..	12·6	..	11·3	..	9·3	..	10·6	..	9·6	..	7·8	..	9·2	..	8·3	..	6·8	..	8·1	..	7·3	..	6·0	..	7·2	..	6·5	..	5·3	..	2
Above the Rule. 1	270		14·9	..	13·3	..	11·0	..	12·1	..	10·9	..	8·9	..	10·2	..	9·2	..	7·5	..	8·8	..	8·0	..	6·5	..	7·8	..	7·0	..	5·8	..	7·0	..	6·3	..	5·2	..	1
Qualities on the Rule. 1	260		14·3	18·5	12·9	20·5	10·6	22·5	11·7	22·6	10·5	25·1	8·6	27·5	9·9	26·7	8·9	29·6	7·3	32·5	8·5	30·8	7·7	34·2	6·3	37·5	7·5	34·9	6·7	38·7	5·6	42·5	6·7	39·0	6·0	43·3	5·0	47·5	1
Qualities on the Rule. 2	250		13·8	..	12·4	..	10·2	..	11·2	..	10·1	..	8·3	..	9·5	..	8·5	..	7·0	..	8·2	..	7·4	..	6·0	..	7·2	..	6·5	..	5·3	..	6·5	..	5·8	..	4·8	..	2
Qualities on the Rule. 3	240		13·2	..	11·9	..	9·8	..	10·8	..	9·7	..	8·0	..	9·1	..	8·2	..	6·7	..	7·9	..	7·1	..	5·8	..	6·9	..	6·3	..	5·1	..	6·2	..	5·6	..	4·6	..	3
Qualities on the Rule. 4	230		12·7	..	11·4	..	9·4	..	10·3	..	9·3	..	7·6	..	8·7	..	7·8	..	6·4	..	7·5	..	6·8	..	5·6	..	6·6	..	6·0	..	4·9	..	5·9	..	5·4	..	4·4	..	4
Qualities on the Rule. 5	220		12·1	..	10·9	..	8·9	..	9·8	..	8·9	..	7·3	..	8·3	..	7·5	..	6·2	..	7·2	..	6·5	..	5·4	..	6·3	..	5·7	..	4·7	..	5·7	..	5·1	..	4·2	..	5
Qualities on the Rule. 6	210		11·6	..	10·4	..	8·6	..	9·4	..	8·5	..	7·0	..	7·9	..	7·2	..	5·9	..	6·9	..	6·2	..	5·1	..	6·1	..	5·5	..	4·5	..	5·5	..	4·9	..	4·0	..	6
Below the Rule. 1	200		11·0	..	9·9	..	8·1	..	9·0	..	8·1	..	6·6	..	7·6	..	6·8	..	5·6	..	6·6	..	5·9	..	4·8	..	5·8	..	5·2	..	4·3	..	5·2	..	4·7	..	3·8	..	1
Below the Rule. 2	190		10·5	..	9·4	..	7·7	..	8·5	..	7·7	..	6·3	..	7·2	..	6·5	..	5·3	..	6·2	..	5·6	..	4·6	..	5·5	..	4·9	..	4·1	..	4·9	..	4·4	..	3·6	..	2
Below the Rule. 3	180		9·9	..	8·9	..	7·3	..	8·1	..	7·3	..	6·0	..	6·8	..	6·1	..	5·0	..	5·9	..	5·3	..	4·4	..	5·2	..	4·7	..	3·9	..	4·7	..	4·2	..	3·4	..	3
Below the Rule. 4	170		9·4	..	8·4	..	6·9	..	7·6	..	6·9	..	5·6	..	6·4	..	5·8	..	4·8	..	5·6	..	5·0	..	4·1	..	4·9	..	4·5	..	3·6	..	4·4	..	4·0	..	3·3	..	4

No. 2.

	1	2	Gr.		52·5				57·5						62·5						67·5						72·5						77·5						1
	Qu.	Dg.	R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		Qu.
			Br.	Gr.	Br.	Gr.	Br.	Gr.	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
Above the Rule.	4	300	7·0	..	6·3	..	5·2	..	6·4	..	5·8	..	4·7	..	5·9	..	5·3	..	4·3	..	5·4	..	4·9	..	4·0	..	5·0	..	4·5	..	3·7	..	4·7	..	4·4	..	3·4	..	4
	3	290	6·8	..	6·1	..	5·0	..	6·2	..	5·6	..	4·5	..	5·7	..	5·1	..	4·2	..	5·2	..	4·7	..	3·9	..	4·8	..	4·4	..	3·6	..	4·5	..	4·1	..	3·3	..	3
	2	280	6·5	..	5·9	..	4·8	..	6·0	..	5·4	..	4·4	..	5·5	..	4·9	..	4·0	..	5·0	..	4·5	..	3·7	..	4·7	..	4·2	..	3·5	..	4·4	..	3·9	..	3·2	..	2
	1	270	6·3	..	5·7	..	4·7	..	5·8	..	5·2	..	4·2	..	5·3	..	4·8	..	3·9	..	4·8	..	4·4	..	3·6	..	4·5	..	4·1	..	3·3	..	4·2	..	3·8	..	3·1	..	1
Qualities on the Rule.	1	260	6·1	43·1	5·5	47·8	4·5	52·5	5·6	47·2	5·0	52·4	4·1	57·5	5·1	51·3	4·6	56·9	3·8	62·5	4·7	55·4	4·2	61·5	3·5	67·5	4·4	59·5	3·9	66·0	3·2	72·5	4·1	63·6	3·6	70·6	3·0	77·5	1
	2	250	5·8	..	5·3	..	4·3	..	5·3	..	4·8	..	3·9	..	4·9	..	4·4	..	3·6	..	4·5	..	4·1	..	3·3	..	4·2	..	3·8	..	3·1	..	3·9	..	3·5	..	2·9	..	2
	3	240	5·6	..	5·1	..	4·1	..	5·1	..	4·6	..	3·8	..	4·7	..	4·2	..	3·5	..	4·3	..	3·9	..	3·2	..	3·9	..	3·6	..	3·0	..	3·7	..	3·4	..	2·8	..	3
	4	230	5·4	..	4·9	..	4·0	..	4·9	..	4·4	..	3·6	..	4·5	..	4·0	..	3·3	..	4·1	..	3·7	..	3·1	..	3·8	..	3·4	..	2·8	..	3·6	..	3·2	..	2·6	..	4
	5	220	5·2	..	4·6	..	3·8	..	4·7	..	4·2	..	3·5	..	4·2	..	3·9	..	3·2	..	3·9	..	3·6	..	2·9	..	3·7	..	3·3	..	2·7	..	3·4	..	3·0	..	2·5	..	5
	6	210	4·9	..	4·4	..	3·6	..	4·4	..	4·0	..	3·3	..	4·1	..	3·7	..	3·0	..	3·8	..	3·4	..	2·8	..	3·5	..	3·1	..	2·6	..	3·2	..	2·9	..	2·4	..	6
Below the Rule.	1	200	4·7	..	4·2	..	3·5	..	4·2	..	3·8	..	3·2	..	3·9	..	3·5	..	2·9	..	3·6	..	3·2	..	2·6	..	3·3	..	3·0	..	2·4	..	3·1	..	2·8	..	2·4	..	1
	2	190	4·4	..	4·0	..	3·3	..	4·0	..	3·6	..	3·0	..	3·7	..	3·3	..	2·7	..	3·4	..	3·1	..	2·5	..	3·1	..	2·8	..	2·3	..	2·9	..	2·6	..	2·2	..	2
	3	180	4·2	..	3·8	..	3·1	..	3·8	..	3·5	..	2·8	..	3·5	..	3·2	..	2·6	..	3·2	..	2·9	..	2·4	..	3·0	..	2·7	..	2·2	..	2·8	..	2·5	..	2·0	..	3
	4	170	4·0	..	3·6	..	3·0	..	3·6	..	3·3	..	2·7	..	3·3	..	3·0	..	2·4	..	3·0	..	2·8	..	2·3	..	2·8	..	2·6	..	2·1	..	2·6	..	2·4	..	1·9	..	4

No. 3.

1	2	Gr.		82·5				87·5						92·5						97·5						102·5						107·5						1
Qu.	Dg.	R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		Qu.
		Br.	Gr.	Br.	Gr.	Br.	Gr.	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
Above the Rule. 4	300	4·4	..	4·1	..	3·2	..	4·1	..	3·7	..	3·0	..	3·9	..	3·5	..	2·9	..	3·6	..	3·3	..	2·7	..	3·4	..	3·1	..	2·6	..	3·3	..	3·0	..	2·4	..	4
3	290	4·2	..	3·8	..	3·1	..	4·0	..	3·6	..	2·9	..	3·7	..	3·4	..	2·8	..	3·5	..	3·2	..	2·6	..	3·3	..	3·1	..	2·5	..	3·2	..	2·9	..	2·4	..	3
2	280	4·1	..	3·7	..	3·0	..	3·8	..	3·4	..	2·8	..	3·6	..	3·2	..	2·7	..	3·4	..	3·1	..	2·5	..	3·2	..	2·9	..	2·4	..	3·1	..	2·8	..	2·3	..	2
1	270	3·9	..	3·5	..	2·9	..	3·7	..	3·3	..	2·7	..	3·5	..	3·1	..	2·6	..	3·3	..	3·0	..	2·4	..	3·1	..	2·8	..	2·3	..	2·9	..	2·7	..	2·2	..	1
Qualities on the Rule. 1	260	3·8	67·7	3·4	75·1	2·8	82·5	3·5	71·8	3·2	79·7	2·6	87·5	3·3	75·9	3·0	84·2	2·5	92·5	3·2	80·0	2·9	88·8	2·4	97·5	3·0	84·1	2·7	93·3	2·3	102·5	2·8	88·2	2·6	97·9	2·1	107·5	1
2	250	3·6	..	3·3	..	2·7	..	3·4	..	3·1	..	2·5	..	3·2	..	2·9	..	2·4	..	3·0	..	2·7	..	2·3	..	2·9	..	2·6	..	2·2	..	2·7	..	2·5	..	2·0	..	2
3	240	3·5	..	3·1	..	2·6	..	3·3	..	2·9	..	2·4	..	3·1	..	2·8	..	2·3	..	2·9	..	2·6	..	2·2	..	2·8	..	2·5	..	2·1	..	2·6	..	2·4	..	2·0	..	3
4	230	3·3	..	3·0	..	2·5	..	3·1	..	2·8	..	2·3	..	2·9	..	2·7	..	2·2	..	2·8	..	2·5	..	2·1	..	2·6	..	2·4	..	2·0	..	2·5	..	2·3	..	1·9	..	4
5	220	3·2	..	2·9	..	2·4	..	3·0	..	2·7	..	2·2	..	2·8	..	2·6	..	2·1	..	2·7	..	2·4	..	2·0	..	2·5	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	5
6	210	3·0	..	2·7	..	2·3	..	2·8	..	2·6	..	2·1	..	2·7	..	2·4	..	2·0	..	2·5	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	2·3	..	2·0	..	1·7	..	6
Below the Rule. 1	200	2·9	..	2·6	..	2·3	..	2·7	..	2·4	..	2·0	..	2·6	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	2·3	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	1
2	190	2·7	..	2·5	..	2·0	..	2·6	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	2·3	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	2·1	..	1·9	..	1·5	..	2
3	180	2·6	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	2·3	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	2·1	..	1·8	..	1·5	..	1·9	..	1·7	..	1·4	..	3
4	170	2·4	..	2·2	..	1·8	..	2·3	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	2·1	..	1·9	..	1·5	..	1·9	..	1·8	..	1·4	..	1·8	..	1·7	..	1·4	..	4

No. 4.

1	2	Gr.	112·5						117·5						122·5						127·5						132·5						137·5						1
Qu.	Dg		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		R		B		C		Qu
			Br.	Gr.	Br.	Gr.	Br.	Gr.	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
Above the Rule. 4	300		3·1	..	2·8	..	2·3	..	3·0	..	2·7	..	2·2	..	2·8	..	2·6	..	2·1	..	2·7	..	2·5	..	2·0	..	2·6	..	2·4	..	1·9	..	2·5	..	2·3	..	1·9	..	4
3	290		3·1	..	2·7	..	2·3	..	2·9	..	2·6	..	2·2	..	2·8	..	2·5	..	2·1	..	2·6	..	2·4	..	2·0	..	2·5	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	3
2	280		2·9	..	2·6	..	2·2	..	2·8	..	2·5	..	2·1	..	2·7	..	2·4	..	2·0	..	2·5	..	2·3	..	1·9	..	2·4	..	2·2	..	1·8	..	2·3	..	2·1	..	1·7	..	2
1	270		2·8	..	2·5	..	2·1	..	2·7	..	2·4	..	2·0	..	2·6	..	2·2	..	1·9	..	2·4	..	2·1	..	1·8	..	2·3	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	1
Qualities on the Rule. 1	260		2·7	92·3	2·5	102·4	2·0	112·5	2·6	96·4	2·3	107·0	1·9	117·5	2·5	100·5	2·2	111·5	1·8	122·5	2·3	104·6	2·1	116·1	1·7	127·5	2·2	108·7	2·0	120·6	1·6	132·5	2·1	112·8	1·9	125·2	1·6	137·5	1
2	250		2·6	..	2·3	..	1·9	..	2·5	..	2·2	..	1·8	..	2·4	..	2·1	..	1·7	..	2·2	..	2·0	..	1·6	..	2·1	..	1·9	..	1·6	..	2·0	..	1·8	..	1·5	..	2
3	240		2·5	..	2·2	..	1·9	..	2·4	..	2·1	..	1·8	..	2·3	..	2·0	..	1·7	..	2·1	..	1·9	..	1·6	..	2·0	..	1·8	..	1·5	..	1·9	..	1·7	..	1·4	..	3
4	230		2·4	..	2·1	..	1·8	..	2·3	..	2·0	..	1·7	..	2·2	..	1·9	..	1·6	..	2·0	..	1·8	..	1·5	..	1·9	..	1·7	..	1·4	..	1·8	..	1·7	..	1·4	..	4
5	220		2·3	..	2·0	..	1·7	..	2·2	..	1·9	..	1·6	..	2·1	..	1·8	..	1·5	..	2·0	..	1·7	..	1·4	..	1·9	..	1·7	..	1·4	..	1·8	..	1·6	..	1·3	..	5
6	210		2·2	..	1·9	..	1·6	..	2·1	..	1·8	..	1·5	..	2·0	..	1·7	..	1·4	..	1·9	..	1·6	..	1·3	..	1·8	..	1·6	..	1·3	..	1·7	..	1·5	..	1·2	..	6
Below the Rule. 1	200		2·1	..	1·9	..	1·5	..	2·0	..	1·8	..	1·4	..	1·9	..	1·7	..	1·4	..	1·8	..	1·6	..	1·3	..	1·7	..	1·5	..	1·2	..	1·6	..	1·4	..	1·2	..	1
2	190		2·0	..	1·8	..	1·4	..	1·9	..	1·7	..	1·4	..	1·8	..	1·6	..	1·3	..	1·7	..	1·5	..	1·2	..	1·6	..	1·4	..	1·2	..	1·5	..	1·4	..	1·1	..	2
3	180		1·8	..	1·7	..	1·4	..	1·7	..	1·6	..	1·3	..	1·6	..	1·5	..	1·2	..	1·6	..	1·4	..	1·2	..	1·5	..	1·3	..	1·1	..	1·4	..	1·3	..	1·0	..	3
4	170		1·7	..	1·6	..	1·3	..	1·6	..	1·5	..	1·2	..	1·5	..	1·4	..	1·1	..	1·5	..	1·3	..	1·1	..	1·4	..	1·3	..	1·0	..	1·3	..	1·2	..	1·0	..	4

In this Table are shown fourteen qualities of malt, and, according to the general term used by Ale Brewers, their corresponding produce of fermentable matter per quarter and per boll.

Qualities.		Degrees per Quarter.	According to the general term used by Brewers—Fermentable Matter.	
			Per Quarter.	Per Boll.
Above the Rules.	4	300	270·0	202·5
	3	290	262·0	196·5
	2	280	252·0	189·0
	1	270	244·0	183·0
Qualities indicated on the Rules.	1	260	234·0	175·5
	2	250	226·0	169·5
	3	240	216·0	162·0
	4	230	208·0	156·0
	5	220	198·0	148·5
	6	210	190·0	142·5
Below the Rules.	1	200	180·0	135·0
	2	190	172·0	129·0
	3	180	162·0	121·5
	4	170	154·0	115·5

As before stated, the Instrument being constructed upon a practical principle, the practical part may be purchased by itself. For the information of practical Brewers, I state my method of working by the Instrument practically.

Brewed 13·5 *Quarters Malt, for Ale, at* 80 *degs.*

By the Instrument.

Malt of 3d Quality.

Pointing No.	3·6	gives Raw	brls.	58·7	at 65·6	degs.
„ „	3·2	„ Boiled	„	43·4	„ 72·8	„
„ „	2·7	„ Cold	„	36·5	„ 80·0	„

Malt of 2d Quality.

Pointing No.	3·7	gives Raw	brls.	50·0	at 65·6	degs.
„ „	3·4	„ Boiled	„	46·0	„ 72·8	„
„ „	2·8	„ Cold	„	37·7	„ 80·0	„

Having, as before directed, set my 13·5 quarters on the slides, I have in the above statements the required produce of two qualities of malt, that is, the 3d and 2d qualities. Being apprehensive that the malt under operation was of a better quality than the 3d, upon which I had for some time been

working, I charged my copper with the raw barrels, as indicated by the pointing No. of the 3d quality, which gives 58·7 raw barrels. I then brought the copper to boil, and tested a sample by the Saccharometer, and found it to indicate 67·4 degs., being 1·8 degs. above 65·6 degs.—the required gravity of the raw worts. I then increased the barrels in the copper to 50·0 barrels, and tested a sample as before, and found it to be 65·6 degs., thus agreeing with the indication of the 2d quality of malt, viz. pointing No. 3·7 gives raw barrels, 50·0 at 65·6 degs.

E. 1. In Copper, Raw	brls.	50·0	at 65·6	degs.
1½ Hours, Boiled	„	46·0	„ 72·8	„
In Tun, Cold	„	37·6	„ 80·0	„

This Brewing was collected E. 6. in No. 3. tun, set temperature 55°, yeast 68 lb. or 5 lb. per quarter, fermented 9 days, attenuated to 36 degs., highest degree of temperature 63°.

The above may be a guide for all practical purposes.

Experimental.

By the two first divisions of the weights, and the graduated measure, may be defined the required weight, avoirdupois, of any soluble Saccharine matter. To give *in one barrel* one degree of gravity by the Saccharometer, the bulk of the weight of the Saccharine is included in the barrel or 36 galls.

	lb.	oz.	Gravity.	Deg.
Average West India Sugar,	1	0	in 1 brl.	1
„ East „	0	15	„	„
„ Lump „	0	15¼	„	„
„ Candy „	0	15	„	„
„ Molasses „	1	2½	„	„
„ Honey „	1	2¼	„	„
„ Manna „	1	2½	„	„

Instance.

Take the first weight of the second division, marked 1, $\frac{1}{36}$. which indicates one pound; or vary the order, and take the fifth weight, marked 1, $\frac{1}{36}$. which indicates one pound, or 36 pounds; likewise reading or varying the graduated measure. Saccharine matter weighed and dissolved thus, will, by the Saccharometer, indicate the degrees of specific gravity. The other weights of the second division, will read $^3/_4$, $^1/_2$, $^1/_4$, and the *first* division, oz. in connection, according to the variation.

COST.

GRAY'S ALE BREWER'S ASSISTANT—THE PRACTICAL PART, ... £4 6 0

Should any purchaser of the practical part of the Instrument afterwards wish the experimental, he may have the same added, on returning the Instrument, at the cost of £2, 13s. 6d. and paying carriage to and from Edinburgh.

GRAY'S ALE BREWER'S ASSISTANT—PRACTICAL AND EXPERIMENTAL, . . £6 15 0

The under-stated Articles, if ordered, made at the following prices :—

A Small Mill,	.	from	£0	5	0	to	£0	15	0
Beam and Scales,	.	„	0	5	0	„	1	0	0
Copper, with Iron Furnace,		„	1	0	0	„	1	10	0
Mash Tun, with Sparging Machine,		„	0	10	0	„	0	10	0
Under Back,	. .	„	0	2	0	„	0	2	0
Cooler,	. . .	„	0	3	0	„	0	5	0
Fermenting Tun,	.	„	0	2	0	„	0	2	0
Casks,	. . .	„	0	8	0	„	0	8	0
			£2	15	0		£4	12	0

Directions as to the Size of the above Articles, for those who may be inclined to furnish them for themselves.

Mill.—Small Coffee-Mill.

Beam and Scales.—Beam, 16 inches.

Copper.—Bottom, Cross, 9 inches,—mouth, 12 inches—depth, 12 inches.

Mash Tun.—Cross, 13 inches—depth, 12 inches.

Under Back.—Cross, 9 inches—depth, 9 inches.

Cooler.—Cross, 24 inches—depth, 5 inches.

Fermenting Tun.—Cross, 12 inches—depth, 14 inches.

Casks.—2 galls. each.

I would recommend malt to be from two to three months old before being used, and in Brewing high-priced Ale, take a quality on the Rules below the *actual* quality of the malt, (which will indicate fewer *barrels*,) so that the richest of the wort may go to the Ale—the afterings may be wrought up in low-priced Ale or Table Beer.

Printed by A. Murray, Milne Square.